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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/677,024	09/30/2003	Alan R. Arthur	200311580-1	9379
22879	7590	06/12/2007	EXAMINER	
HEWLETT PACKARD COMPANY P O BOX 272400, 3404 E. HARMONY ROAD INTELLECTUAL PROPERTY ADMINISTRATION FORT COLLINS, CO 80527-2400			CHUO, TONY SHENG HSIANG	
ART UNIT	PAPER NUMBER			
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06/12/2007	PAPER			

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)
	10/677,024	ARTHUR ET AL.
	Examiner	Art Unit
	Tony Chuo	1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 23 April 2007.  
 2a) This action is FINAL.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1-47 is/are pending in the application.  
 4a) Of the above claim(s) 32-47 is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-31 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on 30 September 2003 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)	5) <input type="checkbox"/> Notice of Informal Patent Application
Paper No(s)/Mail Date _____	6) <input type="checkbox"/> Other: _____

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election with traverse of Group I, claims 1-31 in the reply filed on 4/23/07 is acknowledged. The traversal is on the ground(s) that the search and examination of the claims can be made without serious burden. As previously stated in the restriction requirement, the inventions are independent or distinct because of the their different classifications that would require different fields of search. For example, a search a method of forming an interface would require a different field of search than a system for forming an interface. In addition, the examiner would like to note that a restriction requirement may be made at any time before final action (See MPEP 811). Claims 32-47 are withdrawn from further consideration as being drawn to non-elected inventions. The requirement is still deemed proper and is therefore made FINAL.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-8 are rejected under 35 U.S.C. 102(e) as being anticipated by Cervasco et al (US 2003/0063826).

The Cervasco reference discloses forming an interface "36" between a housing "12" and a bearing set "14" such that slippage occurs at the interface, wherein the housing and bearing set have different rates of volumetric expansion because the housing is made of a polymeric material and the bearing set is made of a metal (See Figure 3 and paragraphs [0016],[0019],[0020]). It is implicit that the interface is formed by the following method steps:

- a) defining an axis of volumetric expansion for a first component "14";
- b) projecting a sphere with a center on the axis;
- c) defining the center of the sphere as the center of growth;
- d) projecting a perimeter of the first component onto the sphere to define a projection line;
- e) forming the interface surface based on a plurality of planes each of which includes the center of growth, a point on the projection line and a tangent to that point on the projection line;
- f) forming the interface surface tangent to all of the planes in the plurality of planes;
- g) defining a second axis of volumetric expansion for a second component "12";
- h) projecting a sphere with a center on the second axis;
- i) defining the center of the sphere as the center of growth;
- j) projecting a perimeter of the second component onto the sphere to define a second projection line;

Art Unit: 1745

- k) forming a second interface surface in the assembly based on a plurality of planes each of which includes the center of growth, a point on the second projection line, and a tangent to that point on the second projection line;
- l) forming the interface surface further comprises forming the interface surface tangent to all of the planes in the plurality of planes;
- m) forming a second component having a complimentary interface surface that is configured to interface with the interface surface, wherein the complimentary interface surface of the second component substantially corresponds to the interface surface;

4. Claims 12-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Higgins (US 5374086).

The Higgins reference discloses a ball joint "20" for a vehicle exhaust system comprising a method of forming the ball joint by mating a spherical housing "32" with a semispherical flange "26" such that the spherical housing is free to articulate within the semispherical flange in response to thermal expansion (See column 2, lines 31-42). It is implicit that the interface between the spherical housing and the semispherical flange is formed by the following method steps:

- a) forming a first component including: determining dimensional characteristics of the first component;
- b) defining an axis of volumetric expansion for the first component;
- c) projecting a sphere having a center on the axis;
- d) defining the center of the sphere as a center of growth of the first component;
- e) projecting a perimeter of the component onto the sphere to define a projection line;

- f) forming an interface surface of the first component based on a plurality of planes each of which includes the center of growth, a point on the projection line, and a tangent to that point on the projection line;
- g) forming a second component having a complimentary interface surface configured to associate with the interface surface;
- h) assembling the first and second components by interfacing the interface surface and the complimentary interface surface to form the assembly;
- i) forming a shear plane between the interface surface and the complimentary interface surface that allows slippage during volumetric cycling of the first and second components;
- j) allowing the shear plane to reduce thermal stress in the first and second components;
- k) forming a plurality of components by: determining dimensional characteristics of each component, defining an axis of volumetric expansion for each component, defining a center of growth for each of the components, forming an interface surface for each of the components with respect to the center of growth for that component, locating a sphere of predetermined radius with a center on the axis of volumetric expansion; locating the sphere along the axis based on a desired location for the interface surface, defining the center of the sphere as the center of growth for that component, projecting a perimeter of that component on the sphere to form a projection line; forming an interface surface of that component based on a plurality of planes each of which includes the center of growth for that component, a point on the projection line for that component and a tangent to that point on the projection line, and assembling the components, assembling the components such that each of the centers of growth

Art Unit: 1745

are substantially coincident, wherein the center of growth for each of the components is the same point.

Examiner's note: The vehicle exhaust system is construed as a thermally cycled device because the exhaust system is heated while the vehicle is running and cooled while the vehicle is not running.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 9-13, 17, 23-29, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Piascik et al (US 6677069) in view of Higgins (US 5374086).

The Piascik reference discloses a radial solid oxide fuel cell stack "100" comprising components that have different rates of volumetric expansion such as cells "106" that are made of ceramic materials and interconnect layers "108" & "110" that are made of metal sheets (See Figure 3 and column 7, lines 52-53, column 8, lines 48-58). It also discloses a distribution section "146" that is construed as an electrical pass through assembly (See Figure 2B). It also discloses bonding the end cell "106" to interconnect "108" by brazing (See column 8, lines 59-61). It also discloses endplates "112" & "114" that are made of ceramic materials that are construed as a ceramic retention feature (See column 7, lines 14-17).

However, Piascik does not expressly teach a method of forming an interface comprising forming an interface surface with respect to a center of growth such that slippage occurs at the interface between the components during volumetric expansion; forming a first component including: determining dimensional characteristics of the first component; defining an axis of volumetric expansion for the first component; projecting a sphere having a center on the axis; defining the center of the sphere as a center of growth of the first component; projecting a perimeter of the component onto the sphere to define a projection line; forming an interface surface of the first component based on a plurality of planes each of which includes the center of growth, a point on the projection line and a tangent to that point on the projection line; forming a second component having a complimentary interface surface configured to associate with the interface surface; forming a plurality of components by: determining dimensional characteristics of each component, defining an axis of volumetric expansion for each component, defining a center of growth for each of the components, and forming an interface surface for each of the components with respect to the center of growth for that component.

The Higgins reference discloses forming an interface surface on spherical housing "32" with respect to a center of growth such that slippage occurs at the interface between the spherical housing and the semispherical flange "26" during thermal expansion (See column 2, lines 35-42). It is implicit that the interface surface is formed by the following methods: forming a first component including: determining dimensional characteristics of the first component; defining an axis of volumetric expansion for the first component; projecting a sphere having a center on the axis;

defining the center of the sphere as a center of growth of the first component; projecting a perimeter of the component onto the sphere to define a projection line; forming an interface surface of the first component based on a plurality of planes each of which includes the center of growth, a point on the projection line and a tangent to that point on the projection line; forming a second component having a complimentary interface surface configured to associate with the interface surface; forming a plurality of components by: determining dimensional characteristics of each component, defining an axis of volumetric expansion for each component, defining a center of growth for each of the components, and forming an interface surface for each of the components with respect to the center of growth for that component.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Piascik fuel cell by forming a first component including: determining dimensional characteristics of the first component; defining an axis of volumetric expansion for the first component; projecting a sphere having a center on the axis; defining the center of the sphere as a center of growth of the first component; projecting a perimeter of the component onto the sphere to define a projection line; forming an interface surface of the first component based on a plurality of planes each of which includes the center of growth, a point on the projection line and a tangent to that point on the projection line; forming a second component having a complimentary interface surface configured to associate with the interface surface; forming a plurality of components by: determining dimensional characteristics of each component, defining an axis of volumetric expansion for each component, defining a center of growth for each of the components, and forming an interface surface for each

of the components with respect to the center of growth for that component in order to reduce the thermal stress at the interface between components that have different rates of thermal expansion.

Examiner's note: The Higgins reference is relevant to the Piascik reference and the applicant's field of endeavor because it solves the same problem of reducing the thermal stress between two components in a thermally cycled device.

7. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Piascik et al (US 6677069) in view of Higgins (US 5374086) as applied to claims 12, 13, and 29 above, and further in view of Anderson et al (US 5799951). However, Piascik as modified by Higgins does not expressly teach a liquid metal seal. The Anderson reference discloses the use of liquid metal seals which utilize the phenomena of surface tension to improve seal between a rotating shaft and its housing (See column 1, lines 23-28). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Piascik/Higgins fuel cell to include a liquid metal seal in order to utilize a material that is capable of forming a reliable seal that allows slippage between two components.

Examiner's note: The Anderson reference is relevant to the Piascik reference, Higgins reference, and the applicant's field of endeavor because it solves the same problem of forming a reliable seal that allows slippage between two components.

#### ***Response to Arguments***

8. Applicant's arguments, see Remarks, filed 1/10/07, with respect to the rejection(s) of claim(s) 1-47 under 35 USC 112, 102, and 103 have been fully

considered and are persuasive. Therefore, the rejections have been withdrawn. However, upon further consideration, new grounds of rejection are made in view of Piascik et al, Higgins, and Cevasco et al.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 8:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC

  
JONATHAN CREPEAU  
PRIMARY EXAMINER